REMARKS

Claims 1, 2, 4, and 5 in the above-identified application are pending while claims 3 and 6 have been withdrawn. With this Response, claims 1, 3 and 4 were amended. Applicant maintains that no new matter has been added with this amendment. Accordingly, claims 1, 2, 4, and 5 are at issue in the above-identified application.

I. Objection to Drawings

Per the Examiner's request, FIGS. 1 and 2 have been designated by a legend stating "Prior Art." The proposed changes to the drawings do not constitute new matter.

II. Objection To Specification

The title has been amended to make it more descriptive, per the Examiner's suggestion. No new matter has been added.

IV. Objection to Abstract

The Abstract has been replaced with a new Abstract wherein all the reference numerals are contained in parenthesis. No new matter has been added.

V. 35 U.S.C. ¶ 102(b) Anticipation Rejection of Claims

Claims 1-6 were rejected under 35 U.S.C. 102(e) as being anticipated by Redon et al. (U.S. Patent No. 6,381,107). Applicants respectfully traverse this rejection.

The present invention is directed to a magnetic tunnel effect type magnetic head having a magnetic tunnel junction element sandwiched with conductive gap layers between a pair of magnetic shielding layers, and a recorder/player adapted to record and/or play back a signal to and/or from a magnetic recording medium by the use of the magnetic tunnel effect type magnetic head. It is well known as a so-called magnetic tunnel effect that in a laminated structure having a thin insulative layer sandwiched between a pair of magnetic layers, when a predetermined

voltage is applied between the pair of magnetic layers, the conductance of a so-called tunnel current varies depending upon the relative angle of magnetization between the pair of magnetic layers. That is, the laminated structure having the thin insulative layer sandwiched between the pair of magnetic layers shows a magneto-resistive effect to the tunnel current flowing through the insulative layer.

Thus, as a magneto-resistive effect element, the magnetic tunnel junction element (will be referred to as "TMR element" hereunder) having a laminated structure having a thin insulative layer sandwiched between a pair of magnetic layers has been attracting the attention in the field of this art. Especially in the field of magnetic heads, attention is focused on a so-called magnetic tunnel effect type magnetic head (will be referred to as "TMR head" hereunder) using the TMR element as a magneto-sensitive element to detect a magnetic signal from a magnetic recording medium.

However, in the process of producing a TMR head, a problem occurs in that nonmagnetic conductive layers, forming together a gap layer, may become elongated when the height of the TMR element in the direction of its depth is adjusted by polishing it on a surface plate. This causes the pair of magnetic shielding layers sandwiching the TMR element between them to become electrically short-circuited, as illustrated in FIG. 3. Thus, a defect may be caused in the medium-opposite face of the produced TMR head by the elongation of the nonmagnetic conductive layers in some cases. In the resulting TMR head 100, no current will flow through a magnetic sensor portion of the TMR element and little playback output will be detected from the magnetic recording medium.

Applicants have discovered, however, that by providing a magnetic tunnel effect type magnetic head having a magnetic tunnel junction element sandwiched with conductive gap layers between a pair of magnetic shielding layers, and by having the conductive gap layer formed from at least one nonmagnetic metal layer containing a metal element selected from Ta, Ti, Cr, W, Mo, V, Nb and Zr, the magnetic head can have an improved face opposite to a recording medium.

Redon et al. describes a magneto-resistive tunnel junction head (hereinafter simply referred to as "TMR head") having a tunnel multilayered film which exhibits a magneto-resistive spin tunnel effect. (See Redon et al., col. 4, lines 28-40) The TMR head also includes common lead and shield layers that may be electrically contacted with the tunnel multilayered film through non-magnetic and conductive gap layers, as illustrated in FIG. 1. (See Redon et al., col. 5, lines 37-42) Each of the gap layers has a layer made of a material selected from Cu, Al, Au, Ta, Rh, Cr, In, Ir, Mg, Ru, W, Zn or an alloy of these materials. (See Redon et al., col. 5, lines 51-62) The gap layers have functions of adjusting a distance between the shields, adjusting the position of the TMR multilayered film and preventing the uniform tunnel current. (See Redon et al., col. 5, lines 51-62) Each of the gap layers is preferably formed of a single layer as illustrated in FIG. 1 but, if desired, may be formed of a laminate body of the materials selected from the foregoing materials. (See Redon et al., col. 5, lines 51-62)

Claims 1, 2, 4, and 5 of the claimed invention require a device that has *both* a magnetic tunnel effect type magnetic head and an inductive type thin-film head having a lower core layer formed of the same material as one of the shielding layers. While Redon et al. describes a device with a magneto-resistive tunnel junction head, Redon et al. does not describe or even suggest a device that has *both* a magnetic tunnel effect type magnetic head and an inductive type thin-film head having a lower core layer formed of the same material as one of the shielding layers, as required by the claimed invention. Accordingly, Applicant submits that claims 1, 2, 4, and 5 of claim invention is neither anticipated by nor obvious over the applied reference. Withdrawal of these grounds of rejection is respectfully requested.

In view of the remarks set forth above, Applicant respectfully submits that the present invention is in condition for allowance. Early notification to such effect is earnestly solicited. Should the Examiner have any remaining issue, Applicant kindly requests that the Examiner contact the undersigned.

Respectfully submitted,

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